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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/173,129	10/15/1998	SONG C. PARK	TI-25320	1320

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TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER
PERALTA, GINETTE

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 05/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/173,129	PARK ET AL.	
	Examiner	Art Unit	
	Ginette Peralta	2814	

-- Th MAILING DATE of this communication app ars on the cov r sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 March 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5-9,12-16 and 19-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-9,12,16,19-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-2, 5-9, 12-16, 19-32 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The inclusion of the limitation of "an explosive reaction" is not enabled by the applicant's specification. Furthermore, the limitation of "introducing O_2 and H_2 in an explosive reaction to said insulating layer, said silicon-containing structure and said conductive structure" is not enabled, as the O_2 and H_2 are introduced to the chamber but not to the insulating layer, the silicon-containing structure or the conductive structure.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-2, 5-9,12-15, and 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanabe et al. in view of Gronet et al. (U. S. Pat. 6,037,273).

Regarding claims 1 and 26, Tanabe et al. shows in col. 13, ll. 20 to col. 16, ll. 67, a method of fabricating, in a semiconductor processing chamber, an electrical device formed in a semiconductor substrate, the method comprising forming an insulating layer 9 over the semiconductor substrate; forming a silicon-containing structure 10 on the insulating layer; forming a conductive structure 11,12 on the silicon-containing structure; and oxidizing a portion of the insulating layer and the silicon containing structure while leaving the conductive structure substantially unoxidized by introducing O_2 and H_2 to a reaction chamber and exposing the insulating layer, the silicon-containing structure and the conductive structure to the gases, such that the reaction between the O_2 and the H_2 does not increase the pressure in the processing chamber beyond a predetermined safe level.

Tanabe et al. discloses the claimed invention with the exception that the O_2 and H_2 are not introduced to semiconductor processing chamber.

Gronet et al. discloses a method of fabricating, in a semiconductor processing chamber an electrical device, the process comprising forming a silicon-containing structure 402 on an insulating layer, oxidizing a portion of the silicon-containing structure and the substrate surface by introducing O_2 and H_2 in the semiconductor

processing chamber, such that the reaction between the O_2 and the H_2 does not increase the pressure beyond a predetermined safe level, this method being used for the disclosed intended purpose of generating moisture in a semiconductor processing chamber that does not suffer from safety issues and which can use a full spectrum of gas mixtures as well as concentration ratios.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to mix the hydrogen and the oxygen inside the semiconductor processing chamber as Gronet et al. teaches for the disclosed intended purpose of generating moisture in a semiconductor processing chamber that does not suffer from safety issues and which can use a full spectrum of gas mixtures as well as concentration ratios, while also being able to effectively control the amount and component ratio of the gases introduced to the chamber as Tanabe et al. discloses.

Regarding claim 2, Tanabe et al. shows the electrical device may be one of a memory device, a transistor, a logic device, or a capacitor(col. 11, ll. 21- col. 12, ll. 20).

Regarding claim 5, Tanabe et al. shows the insulating layer 9 comprises silicon oxide (col. 13, ll. 24-25).

Regarding claim 6, Tanabe et al. shows the silicon-containing structure comprises doped polycrystalline silicon (col. 13, ll. 47).

Regarding claim 7, Tanabe et al. shows the conductive structure is comprised of an oxygen-sensitive material, in the instant case, tungsten (col. 15, ll. 38-52).

Regarding claim 8, Tanabe et al. shows the conductive structure comprises tungsten(col. 13, ll. 50-53, col. 15, ll. 38-52).

Regarding claim 9, Tanabe et al. teaches a method of oxidizing, in a semiconductor processing chamber, a first feature while leaving a second feature substantially unoxidized (col. 15, ll. 38-61), the method comprises subjecting the first and second features to O_2 and H_2 in a reaction, such that the reaction between the O_2 and the H_2 does not increase the pressure in the processing chamber beyond a predetermined safe level.

Regarding claim 12, Tanabe et al. shows the first feature 14A, 14B or 14C, comprising polycrystalline silicon (col. 13, ll. 48).

Regarding claim 13, Tanabe et al. shows the first feature 14A, 14B or 14C, comprising silicon oxide (col. 13, ll. 24).

Regarding claim 14, Tanabe et al. shows the first feature 14A, 14B or 14C, comprising a dielectric material 9.

Regarding claim 15, Tanabe et al. shows the second feature 14A, 14B or 14C, comprising tungsten (col. 13, ll. 50).

Regarding claims 20 and 27, Tanabe et al. shows the oxidizing of a portion of the insulating layer and the silicon-containing structure while leaving the conductive structure substantially unoxidized by introducing O_2 and H_2 in a reaction in a portion of a process chamber's total volume, such that the reaction between the O_2 and the H_2 occurs continuously as the O_2 and H_2 enter the chamber (col. 14, ll. 56-65).

Regarding claims 21, 23, and 28 Tanabe et al. shows the oxidizing step including the introduction of the O_2 and H_2 in a predetermined ratio and mass flow controllers for opening or closing the passage of gases, by which the amount and component ratio of the gases introduced into the reactor are controlled precisely (col. 14, ll. 56-65).

Regarding claim 22, Tanabe et al. shows the introduction of the O_2 and H_2 in a reaction in a portion of a process chamber's total volume, such that the reaction between the O_2 and H_2 occurs continuously at the O_2 and H_2 enter the chamber (col. 15, ll. 1-12).

Tanabe et al. shows in col. 13, ll. 20 to col. 16, ll. 67, a method of fabricating, in a semiconductor processing chamber, an electrical device formed in a semiconductor substrate, the method comprising forming an insulating layer 9 over the semiconductor substrate; forming a silicon-containing structure 10 on the insulating layer; forming a conductive structure 11,12 on the silicon-containing structure; and oxidizing a portion of the insulating layer and the silicon containing structure while leaving the conductive structure substantially unoxidized by introducing O_2 and H_2 to a reaction chamber and exposing the insulating layer, the silicon-containing structure and the conductive structure to the gases, such that the reaction between the O_2 and the H_2 does not increase the pressure in the processing chamber beyond a predetermined safe level.

Thus, Tanabe et al. is shown to teach all of the features of the claim with the exception of introducing the O_2 and H_2 at a low pressure and increasing the pressure of the chamber as the reaction begins.

It would have been within the scope of one of ordinary skill in the art to vary the concentration of one of the reactants after the introduction into the chamber of the gases and the reaction begins, in order to form an oxide with a desired thickness, therefore it would not yield any unexpected results as the selectivity towards the conductive structure is maintained by the use of specific reactive gases, and that the reaction occurs continuously as the O_2 and H_2 enter the chamber as the gases are introduced at a temperature where the reaction is favored, and the total pressure is controlled by starting the flow of hydrogen at a lower pressure in order to prevent a violent reaction.

4. Claims 16, 19, 24-25 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (U. S. Pat. 5,814,526) in view of Tanabe et al. and Gronet et al..

Regarding claim 16, Tseng shows a method of fabricating a capacitor having a dielectric between a bottom electrode and a top electrode and situated over a semiconductor substrate, the method comprising providing a bottom electrode 44 over the semiconductor substrate; providing a dielectric material 46 over the bottom electrode 44, wherein the bottom electrode may be formed of polysilicon or a tungsten compound, and the dielectric material is a oxide/nitride/oxide layer formed by a series of depositions that include exposing the structure to a dry oxygen ambient to form the top oxide layer.

Tseng shows all the features in the claim with the exception of subjecting the bottom electrode and the dielectric material to O_2 and H_2 in a reaction, wherein the

dielectric material is oxidized and the bottom electrode remains substantially unoxidized.

Tanabe et al. shows a method of subjecting a conductive structure containing a polycrystalline silicon and/or tungsten compound, and a dielectric layer to O_2 and H_2 in a reaction in order to oxidize the dielectric material and maintaining the conductive structure substantially unoxidized, in a way that the reaction between the O_2 and the H_2 does not increase the pressure in the processing chamber beyond a predetermined safe level, for the disclosed intended purpose of reducing or eliminating the oxidation of the conductive material that would incur in an increase in the resistance of the material of the partial peel off of the film from the substrate.

Gronet et al. discloses a method of fabricating, in a semiconductor processing chamber an electrical device, the process comprising forming a silicon-containing structure 402 on an insulating layer, oxidizing a portion of the silicon-containing structure and the substrate surface by introducing O_2 and H_2 in the semiconductor processing chamber, such that the reaction between the O_2 and the H_2 does not increase the pressure beyond a predetermined safe level, this method being used for the disclosed intended purpose of generating moisture in a semiconductor processing chamber that does not suffer from safety issues and which can use a full spectrum of gas mixtures as well as concentration ratios.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to mix the hydrogen and the oxygen inside the semiconductor

processing chamber as Gronet et al. teaches for the disclosed intended purpose of generating moisture in a semiconductor processing chamber that does not suffer from safety issues and which can use a full spectrum of gas mixtures as well as concentration ratios, while also being able to effectively control the amount and component ratio of the gases introduced to the chamber as Tanabe et al. discloses.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the oxidation method taught by Tanabe et al. in the invention of Tseng when treating the dielectric layer of Tseng for the disclosed intended purpose of Tanabe et al. of oxidizing the dielectric layer without substantial oxidizing of the conductive structure that could result in an increase in the resistance of the conductive structure or the peeling off of the film from the substrate.

Regarding claim 19, Tseng teaches the dielectric material comprising an oxide/nitride stack(col. 5, ll. 53-61), and also teaches the use of tantalum pentoxide as a dielectric for capacitors(col. 1, ll. 40).

Regarding claim 24, Tseng as modified by Tanabe et al. shows the introduction of the O_2 and H_2 in a reaction in a portion of a process chamber's total volume, such that the reaction between the O_2 and H_2 occurs continuously at the O_2 and H_2 enter the chamber (col. 15, ll. 1-12).

Regarding claim 25, Tseng as modified by Tanabe et al. shows the oxidizing step including the introduction of the O_2 and H_2 in a predetermined ratio and mass flow controllers for opening or closing the passage of gases, by which the amount and

component ratio of the gases introduced into the reactor are controlled precisely (col. 14, ll. 56-65).

Regarding claim 31, Tseng as modified by Tanabe et al. teaches all the limitations in the claim with the exception of introducing the O_2 and H_2 at a low pressure and increasing the pressure once the reaction begins. Although this feature is not explicitly taught by either Tseng or Tanabe et al., it would have been within the scope of one of ordinary skill in the art to vary the concentration of one of the reactants after the introduction into the chamber of the gases and the reaction begins, in order to form an oxide with a desired thickness, therefore it would not yield any unexpected results as the selectivity towards the conductive structure is maintained by the use of specific reactive gases, and that the reaction occurs continuously as the O_2 and H_2 enter the chamber as the gases are introduced at a temperature where the reaction is favored, and the total pressure is controlled by starting the flow of hydrogen at a lower pressure in order to prevent a violent reaction.

Response to Arguments

5. Applicant's arguments with respect to claims 1-2, 5-9, 12-16, 19-32 have been considered but are moot in view of the new ground(s) of rejection.

With regards to Applicant's argument that the specification clearly describes a reaction that is well known as an explosive reaction to those skilled in the art, it is noted that there is no language in the specification to support the term "explosive".

Conclusion

2. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ginette Peralta whose telephone number is (703)305-7722. The examiner can normally be reached on Monday to Friday 8:00 AM- 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703)308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

GP
May 16, 2003

SUPERVISORY PRIMARY EXAMINER
TECHNOLOGY CENTER 2800